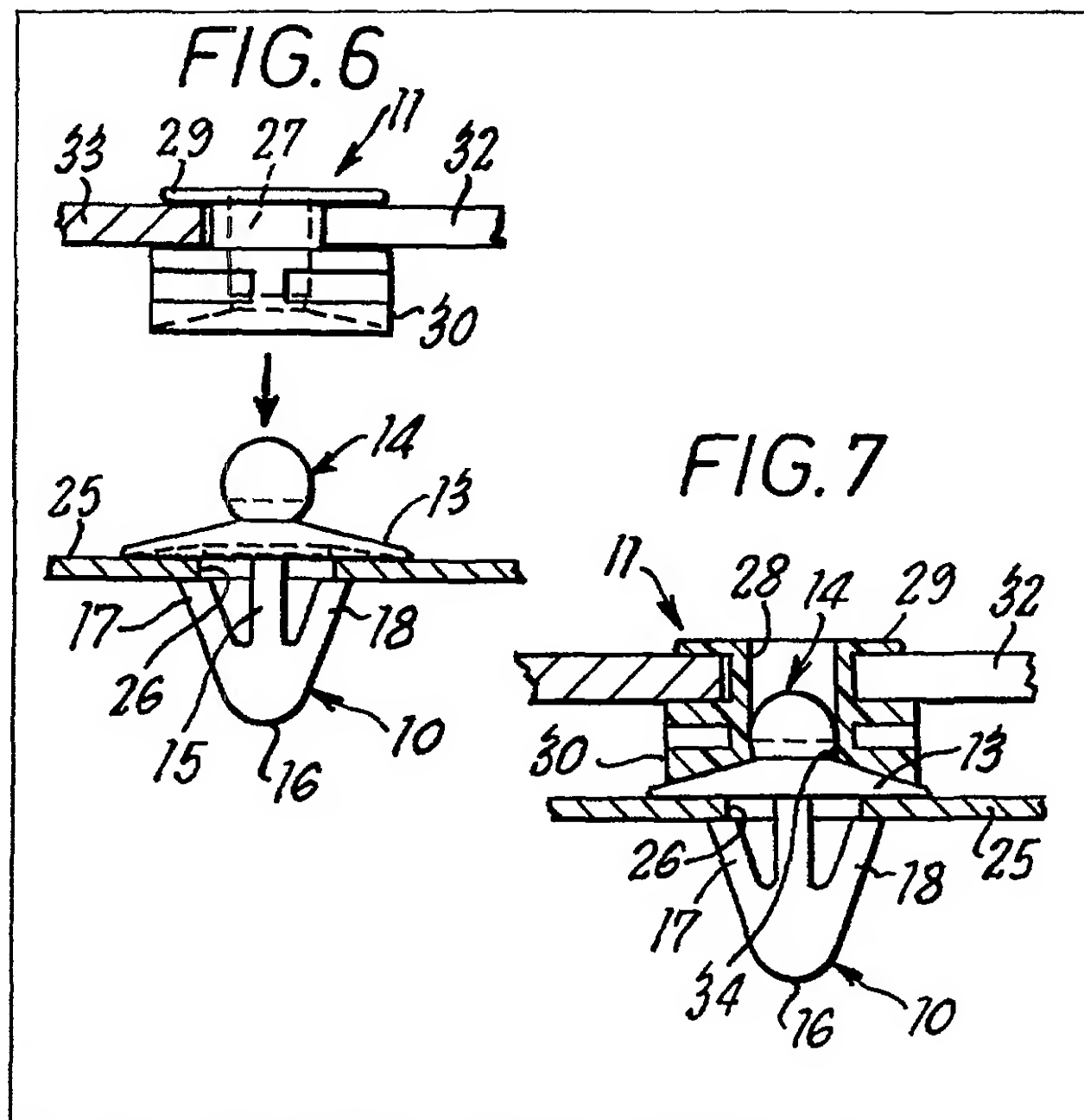


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(54) Two part fastener

(57) A two-part fastener comprises a stud portion (10) and a socket portion (11) for attaching two members together such as a trim pad to a vehicle panel. The stud portion has an anchor (15) for attaching it to a first panel member (25) and a generally spherical stud element (14). The socket portion has a constricted bore (28) adapted to receive the stud (14) with snap action and means (29) for attaching it to a second member (32). Either the stud or the socket or both may be resilient.



The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

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FIG. 1

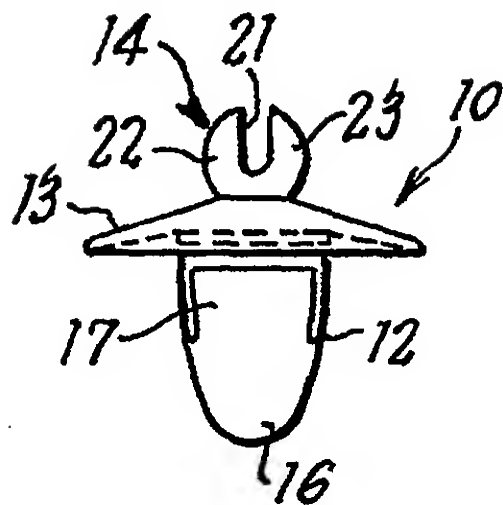


FIG. 2

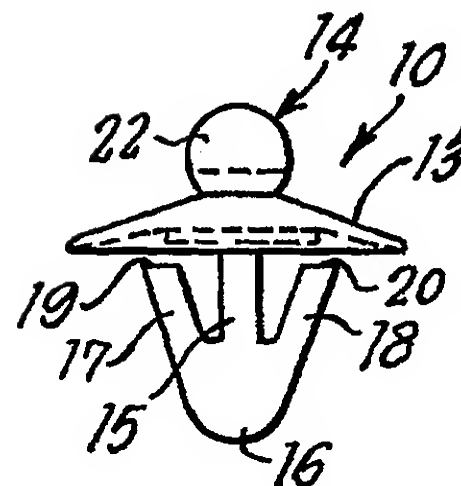


FIG. 3

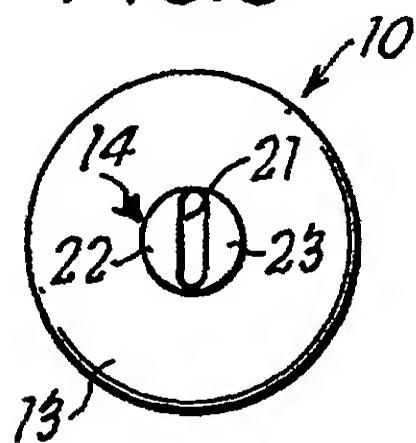


FIG. 4

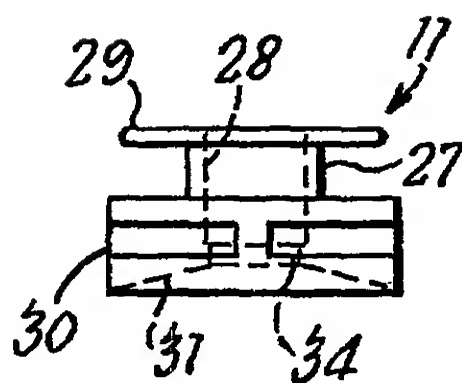


FIG. 5

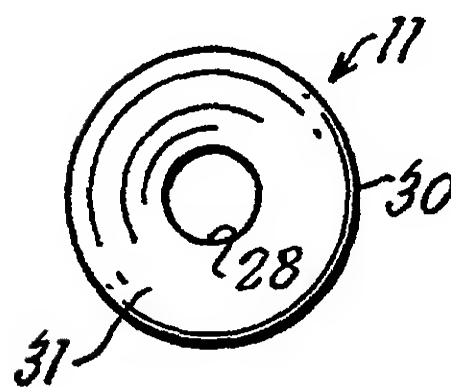


FIG. 6

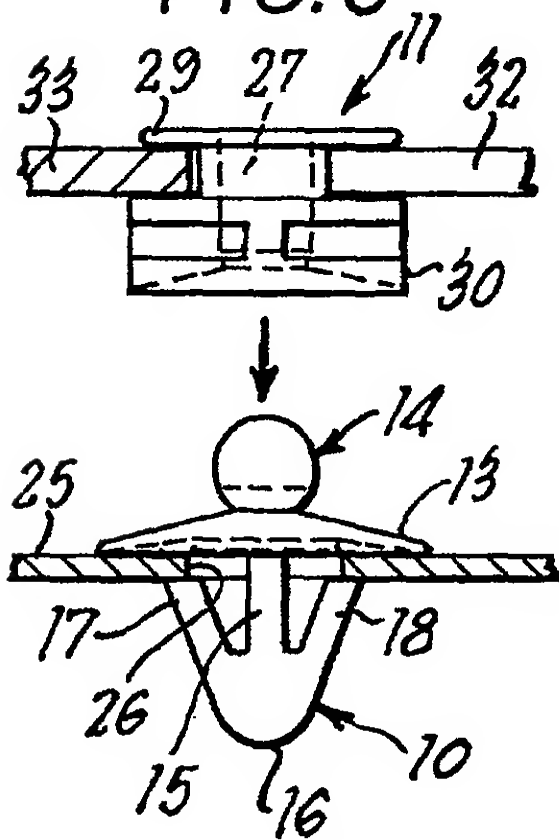
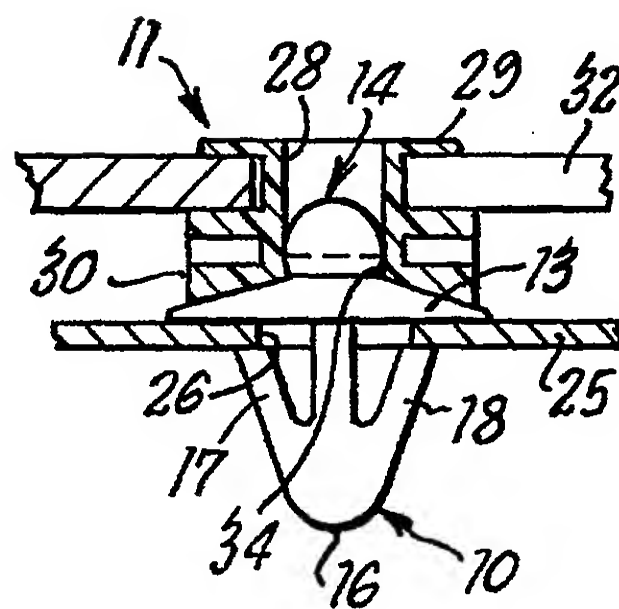


FIG. 7



SPECIFICATION

Two part fastener assembly

5 The present invention is concerned with a two part fastener assembly for attaching two panel or sheet elements together, for instance for attaching a vehicle trim pad or floor covering to a supporting panel which forms a part of the vehicle body.

10 In the vehicle industry it is the practice to attach trim pads to the inside of the door and body panels of the vehicle with the aid of a plurality of clips or fasteners. One of the most successful forms of vehicle trim pad fastening used hitherto comprises a one piece fastener having a nose or stud portion which is inserted into a hole in the support panel and a head portion which is attachable in a key-hole slot in the trim pad. The stud or nose portion of this type of fastener is resilient and removably attached in the hole in the support panel and the head of the fastener is slideably engaged in the keyhole slot in the trim pad. In order to mount the trim pad on the vehicle panel, the fasteners are first attached to the trim pad, the trim pad is then brought up to the support panel and the projecting nose or stud portions of the fasteners are pressed home into the holes in the support panel. If it is necessary to remove the trim pad for repair, this is done by applying sufficient force to withdraw the nose or stud portions of the fasteners from the holes in the support panel.

This known type of vehicle trim pad fastening has a number of disadvantages. When the trim pad is brought up to the support panel, there is little tolerance provided for the positioning of the holes in the support panel. If one or more of these holes is slightly out of position it becomes impossible to apply the trim pad and a failure will occur in the assembly operation. There is also little, if any, tolerance allowed for in the size and shape of the holes in the support panel. If the size of these holes is not correct, to within very small tolerances, then the nose or stud portion of the fastener will not grip the support panel properly or alternatively will break as it is forced into the hole. Problems can also arise when it is necessary to remove the trim pad panel from the support panel. If the panel hole is not accurately formed to small tolerances the nose or stud portions of the fasteners will break or the trim pad itself will be damaged, as frequently occurs when too great a force has to be applied. If the latter occurs, the complete assembly of trim pad and fasteners must be replaced by a new one.

It is therefore an object of the present invention to provide a two part fastener assembly which can be used to attach a vehicle trim pad to a support panel so that the trim pad is readily removable numerous times from the support panel at a generally constant applied force (the "peel force") which may be e.g. 20 to 40 lb and reattachable to the support panel.

It is a further object of the present invention to provide a fastener for this purpose which allows for a reasonable tolerance in the diameter of the holes in the support panel, the shaping of the holes in the support panel and the positioning of the holes in the

support panel relative to the trim pad without unduly affecting the ease with which the trim pad can be mounted on and removed from the panel.

In one embodiment of the present invention, we provide a two part fastener comprising a stud portion and a socket portion, the stud portion having attachment means for attaching the stud portion to a first panel member and a connecting element and the socket portion having a bore adapted to receive the connecting element and attachment means for attaching the socket portion to a second member, wherein the connecting element is generally spherical, the bore in the socket portion has a constricted portion and the maximum diameter of the connecting element is greater than the minimum diameter of the constricted portion of bore so that the connecting element is a force fit in the bore.

The bore in the socket portion may have a generally cone shaped entrance, the maximum diameter of which is greater than the maximum diameter of the connecting element to serve as a guide for the connecting element when the socket portion is brought up to the connecting element.

The connecting element may be resiliently compressible and in a preferred embodiment is divided by a slot into two resiliently deflectable portions. Alternatively the constricted portion of the bore in the socket portion may be resiliently expansible, in which case the connecting element may be solid and therefore relatively rigid.

The attachment means on the socket portion may comprise a flange adapted to limit insertion of the socket portion through the aperture in the second member or, alternatively, may comprise two spaced flanges adapted to slideably mount the socket portion in a slot in the second member.

The attachment means on the stud may comprise a shank adapted for insertion through an aperture in the first panel member and a flange adapted to limit insertion of the shank through the aperture, and the shank may be so designed that it is non-removable from the aperture.

Both the socket portion and the stud portion are preferably formed from a synthetic plastics material as integral injection mouldings and the socket and stud portions may initially be connected together by easily frangible web elements.

Preferred forms of the present invention will now be described with reference to the accompanying drawings, in which:

Figure 1 is an elevation of the stud portion of a two part fastener according to the present invention;

Figure 2 is a side elevation of the stud portion shown in *Figure 1*;

Figure 3 is a top plan of the stud portion shown in *Figures 1* and *2*;

Figure 4 is an elevation of the socket portion of the fastener;

Figure 5 is an underplan of the socket portion shown in *Figure 4*;

Figure 6 is an elevation showing the stud and socket portions of *Figures 1* to *5* mounted respectively in a trim pad and in a support panel;

Figure 7 is an elevation partly in section showing the stud and socket portions attached together to

mount the trim pad on the support panel;

Figure 8 is a section through a socket portion forming a modification of the socket portion shown in *Figures 4 and 5*;

5 *Figure 9* is a section through a further modification of the socket portion;

Figure 10 is an underplan of the socket portion shown in *Figure 9*;

10 *Figure 11* is an elevation partly in section showing stud and socket portions of yet a further modification of the two part assembly of the present invention attaching a carpet to a vehicle floor panel.

In *Figures 1 to 7* of the drawings, the stud portion of a two part fastener assembly according to the present invention is indicated generally at 10 and the socket portion is indicated generally at 11. Both the stud portion 10 and the socket portion 11 of the two part assembly are formed from a suitable synthetic plastics material as injection mouldings.

20 The stud portion 10 comprises a shank 12, a sealing skirt 13 and a connecting element 14. The shank 12 comprises a stem 15 terminating in a nose 16 and two legs 17 and 18 which extend rearwardly and outwardly from the nose 16 towards the skirt 13. 25 The legs 17 and 18 have end faces 19 and 20, respectively, which act as abutments to lock the shank in position in an apertured panel. The skirt 13 of the stud portion 10 is resilient and frusto-conical, surrounding the adjacent portion of the stem 15 and terminating in the plane of or just short of the abutment faces 19, 20. The connecting element 14 is generally spherical but is divided by a slot 21 into two compressible portions 22 and 23.

In use, the stud portion 10 may be mounted in a 35 vehicle panel 25, which is formed with a circular hole 26, by pressing the shank 12 through the hole 26 until the legs 17 and 18 snap through the hole and the surfaces 19 and 20 abut the undersurface of the panel 25. In this condition, the skirt 13 is flattened 40 slightly against the outer surface of the panel 25 and forms a seal around the hole 26. The abutment faces 19 and 20 lock behind the panel 25 so that the stud portion 10 cannot be removed from the panel without damaging or breaking the shank 12.

45 The socket portion 11 comprises a cylindrical bush 27 formed with a cylindrical through bore 28 terminating in a smaller diameter cylindrical rib 34 which defines a constricted bore portion. The diameter of the bore 28 is equal to or slightly larger than the 50 maximum diameter of the spherical connecting element 14 of the stud portion, the diameter of the rib 34 which defines the constricted portion being smaller than the maximum diameter of the connecting element. Externally, the socket portion 11 is 55 formed with an outer circumferential flange 29 and an inner circumferential flange 30. The bore 28 has a conically flared entry 31 which is formed in the inner flange 30, the maximum diameter of the conical entry being substantially greater than the maximum 60 diameter of the connecting element.

The vehicle trim pad 32 is provided with a plurality of key-hole slots 33 and a socket portion is mounted in each of these slots. The key-hole slots may be generally as shown in *Figure 16* of British Patent 65 Specification 1,036,423 having a large circular hole

and a small circular hole interconnected by a slot.

These slots are desirably dimensioned in relation to the socket portions 11 such that the large hole is of greater diameter than the flange 29, and the small diameter hole is of slightly greater diameter than the neck 27, to allow a sufficient degree of tolerance.

70 Each socket portion 11 is fitted in a key-hole slot 33, by inserting the outer flange 29 of the socket portion through the larger hole of the key-hole slot and then 75 sliding the socket portion along the key-hole slot into the smaller hole. The slot interconnecting the two holes is desirably slightly smaller in width than the neck 27, so that once the socket portion 11 has been forced into the smaller hole it is trapped in place, and 80 retained by flanges 29 and 30.

The vehicle panel 25 on which the trim pad is to be mounted is also formed with a plurality of holes 26 in each of which a stud portion 10 is mounted. In order to mount the trim pad on the support panel the trim 85 pad is brought up to the support panel 25 and the socket portions 11 are aligned with the connecting elements 14 of the stud portions 10. The trim pad is then pressed home against the panel 25 so that the connecting element of each stud portion enters the 90 flared entry end of the corresponding bore of each socket element where it is a snap fit through the small diameter bore formed by rib 34. The trim pad is thereafter retained in position by the frictional resistance created by the rib 34 gripping around the 95 neck portion of connecting element 14.

Alternatively the assembly of stud portion and socket portion may be supplied to the customer attached together. The customer may then fit the assemblies to the trim pad and thereafter fit the trim 100 pad to the panel by means of the shanks 12.

It at any time it is necessary to remove the trim pad from the panel 25 this can be done by providing sufficient withdrawal force ("peel force") on the trim pad to overcome the frictional resistance of the 105 connecting elements and force the trim pad away from the panel.

In the assembly operation of the trim pad to the panel, it will be seen that the flared entry 31 to the bore in each socket portion provides a means of 110 guiding the socket portion and aligning it with the connecting element of the stud portion. There is a limited play between the socket portion and the trim pad 32 so that the socket portion will automatically move into correct alignment with the connecting 115 element of the stud portion during this assembly operation.

In some applications it may be desirable to provide for tension between the socket portion and the trim pad so as to eliminate vibration in which 120 case the socket portion may be modified as shown in *Figure 8*. In *Figure 8* a socket portion is indicated generally at 40 having an inner flange 41 which includes a flexible skirt 42 which is flared towards the outer flange 43 and which will flatten against the trim pad so as to tension and clamp the trim pad 125 against the outer flange 43.

In other applications, it may be desirable to provide for a more controlled retention of the socket portion on the connecting element of the stud 130 portion, in which case it may be advantageous to

form the constricted portion of internal retaining tongues. A socket portion modified in this way is indicated generally at 50 in Figures 9 and 10. The socket portion 50 has an internal bore 51 and is provided also with internal resilient tongues 52 within the bore 51 which are directed away from the flared entry of the bore towards the outer end of the bore. When the socket portion 50 is mounted on the connecting element of the stud portion, the flexible tongues 52 are forced radially outwardly until they pass beyond the point of maximum diameter of the connecting elements whereupon they locate behind the connecting element and resist withdrawal of the socket portion therefrom.

If the socket portion is provided with resilient tongues as in the socket portion 50, it may be desirable to reduce the compressibility of the connecting element, in which case the connecting element may be formed with an axial bore or, alternatively, may be made in the form of a solid ball or sphere.

A further embodiment of the present invention comprises a stud portion 60 and a socket portion 61 which are shown in Figure 11. The stud portion 60 is similar to the stud portion 10 of Figures 1 to 7 and has a generally spherical connecting element 62, which may be solid or split into two portions, as in Figures 1 to 7, or formed with an axial bore to increase its compressibility.

The socket portion 61 comprises a cylindrical bush 63 having a cylindrical through bore 64, an internal rib 65 forming a constricted portion in the bore and a conical flared entry end 66. Externally the socket portion is provided with a single outer circumferential flange 67 at the opposite end of the bush to the entry end 66 which is also flared externally.

In use, the stud portion 60 is mounted in a hole 68 in the support panel 69, as in Figure 6. A second member 70, which may comprise a vehicle floor mat, is provided with a plurality of apertures 71 positioned to coincide with the projecting connecting elements 62. A socket portion 61 is mounted in each aperture 71 by deforming and stretching the aperture slightly to force the flared end 66 through the aperture. The floor mat 70 is then brought up to the panel 69 and each socket portion is pressed home onto a connecting element 62 until the connecting element has been forced past the rib 65. Each socket is then securely mounted on a connecting element to attach the floor mat 70 to the support panel.

Thereafter the floor mat 70 can be peeled away from the support panel by applying a sufficient pull off force to overcome the frictional grip exerted on the connecting elements 62 by the socket portions 61.

It will be seen from the above that we have provided a fastener which is particularly suitable for attaching a trim pad to a support panel of a vehicle in such a manner that the trim pad can be quickly and easily mounted on the support panel, is securely held in place but can be readily removed and re-applied a great number of times without the risk of damage to either the trim pad or the fasteners themselves.

It will also be seen that we have provided a fastener which allows for substantial tolerance in the

positioning of the holes in the support panel in relation to the slots in the trim pad, and which also allows for some inaccuracy in the diameter and shape of the holes provided in the support panel without the risk of insecure mounting or damage to the fasteners when the trim pad is applied to or removed from the support panel.

CLAIMS

1. A two-part fastener comprising a stud portion and a socket portion, the stud portion having attachment means for attaching the stud portion to a first panel member and a connecting element and the socket portion having a bore adapted to receive the connecting element and attachment means for attaching the socket portion to a second member, wherein the connecting element is generally spherical, the bore in the socket portion has a constricted portion and the maximum diameter of the connecting element is greater than the minimum diameter of the constricted portion of the bore so that the connecting element is a force fit in the bore.

2. A fastener as claimed in claim 1, wherein the bore in the socket portion has a generally cone shaped entrance, the maximum diameter of which is greater than the maximum diameter of the connecting element.

3. A fastener as claimed in claim 1 or claim 2, wherein the connecting element is resiliently compressible.

4. A fastener as claimed in claim 3, wherein the connecting element is divided by a slot into two resiliently deflectable portions.

5. A fastener as claimed in claim 3, wherein the connecting element is formed with an axially extending bore.

6. A fastener as claimed in any preceding claim, wherein the constricted portion of the bore in the socket portion is resiliently expansible.

7. A fastener as claimed in any preceding claim, wherein the attachment means on the socket portion comprises a flange adapted to limit insertion of the socket portion through an aperture in the second member.

8. A fastener as claimed in any of claims 1 to 6, wherein the attachment means on the socket comprises two spaced flanges adapted to slideably mount the socket portion in a slot in the second member.

9. A fastener as claimed in any preceding claim, wherein the attachment means on the stud comprises a shank adapted for insertion through an aperture in the first panel member and a flange adapted to limit insertion of the shank through the aperture.

10. A fastener as claimed in claim 9, wherein the shank is adapted to be non-removable from the aperture in the first panel member.

11. A fastener as claimed in any preceding claim, wherein the stud portion and the socket portion are initially joined by frangible web elements.

12. A fastener as claimed in claim 9, wherein the connecting element is connected to the flange on the stud portion by a necked portion of substantially smaller diameter than the maximum diameter of the

connecting element.

13. A two part fastener assembly substantially as described herein with reference to the accompanying drawings.

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